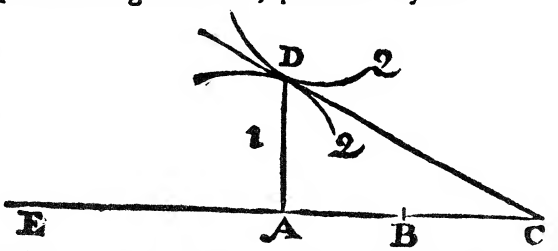
An Extract of a Letter from the Excellent *Renatus Franciſcus Sluſius*, Canon of *Liege* and Counſellor to his Electoral Highneſs of *Collen*, written to the Publiſher in order to be communicated to the *R. Society*; concerning his ſhort and eaſie *Method of drawing Tangents to all Geometrical Curves* without any labour of Calculation: Here inſerted in the ſame language, in which it was written.

—*Methodum meam ducendarum ad Curvas quaſlibet Geometricas Tangentium mitto ad Te, & Virorum Doctiſſimorum* R. Societatis *cenſuræ ſubmitto. Brevis mihi viſa eſt ac facilis, quippe quam puer ἀγραμμάτιστος doceri poſſit, & quæ abſque ullo calculi labore ad omnes omnino lineas extendatur: Malo tamen aliis talem videri quàm mihi, cùm in rebus noſtris cæcutire plerumque ſoleamus.*

Fig 1. *Data ſit igitur qualibet Curva D Q, cujus puncta omnia referantur ad Rectam quamlibet datam E A B per Rectam D A; ſive E A B ſit diameter ſeu alia qualibet, ſive etiam aliæ ſimul lineæ datæ ſint, quæ, vel quarum poteſtates Æquationem ingrediantur; parùm id refert.*



In Æquatione Analytica, facilioris explicationis cauſâ, D A perpetuò dicatur v, *B A*, y. *E B verò & aliæ quantitates datæ*, Conſonantibus *exprimantur. Tum ſupponatur ducta D C, tangens curvam in D, & occurrens E B, productæ, ſi opus ſit, in puncto C; & C A perpetuò quoque dicatur* a. *Ad inveniendam A C vel* a, *hæc erit* Regula Generalis;

1. *Rejectis ab æquatione partibus, in quibus* y *vel* v *non invenitur; ſtatuantur ab uno latere omnes in quibus eſt* y, *& ab altero illæ in quibus habetur* v, *cum ſuis ſignis* + *vel* —. *Hoc, dextrum, illud, ſiniſtrum latus, facilitatis cauſâ, vocabimus.*

2. *In latere dextro, præfigatur ſingulis partibus exponens poteſtatis quam in illis obtinet* v; *ſeu, quod idem eſt, in illum ducantur partes.*

3. *Fiat idem in latere ſiniſtro, præponendo ſcil. unicuique illius parti Exponentem poteſtatis quam in illa habet* y. *Sed & hoc amplius: Unum* y *in ſingulis partibus vertatur in* a.

Ajo, Æquationem ſic reformatam modum oſtendere ducendæ Tangentis ad punctum D datum. Cùm enim eo dato, pariter datæ ſint y *&* v, *& cæteræ quantitates, quæ Conſonantibus exprimuntur; a non poterit ignorari.*

Si

Si quid forte ſit obſcuritatis in Regula, *aliquot exemplis illuſtrabitur: Data ſit hæc Æquatio* b y − y y = v v ; *in qua EB ſit* b, *BA*, y, *DA*, v, *& quæratur* a *ſive AC talis, ut juncta DC tangat Curvam DQ in D. Ex* regula, *nihil rejiciendum eſt ab hac Æquatione, cùm in ſingulis ejus partibus reperiatur* y *vel* v. *Ita quoque diſpoſita eſt, ut ab uno latere ſint omnes illius partes in quibus* y ; *ab altero, omnes in quibus* v. *Singulis itaque tantùm præfigendus eſt Exponens poteſtatis, quam in illis habet* y *vel* v ; *& in latere ſiniſtro unum* y *vertendum in* a, *ut fiat* b a − 2 y a = 2 v v. *Ajo nunc, hanc Æquationem oſtendere modum ducendæ Tangentis ad punctum D, ſive* $a = \frac{2vv}{b-2y} = AC$.

Sic ſi data fuerit æquatio q q + b y − y y = v v ; *eadem planè fieret cum priori Æquatio pro Tangente, abjecto ſcil.* q q, *ut Regula præſcribit.*

Sic ex 2 b y y − $y^3 = v^3$ *fit* 4 b y a − 3 y y a = 3 v^3 *ſive* $a = \frac{3v^3}{4by-3yy}$: *Ex* b b y + z y y + $y^3 = qvv$, *fit* b b a + 2 z y a + 3 y y a = 2 q v v *&* $a = \frac{2qvv}{bb+2zy+3yy}$: *Ex* $b^4 + by^3 - y^4 = qqvv + zv^3$, *fit* $3by\,y\,a - 4y^3a^3 = 2qqvv + 3zv^3$ *&* $a = \frac{2qqvv+3zv^3}{3by-4y^3}$.

Verùm in ſimilibus æquationibus nullam arbitror accidere poſſe difficultatem. Aliqua fortaſſe in illis occurret, quarum partes quædam conſtant ex productis y *in* v : *Ut* y v, y y v + y^3 v v, *&c. Sed hæc quoque levis eſt, ut exemplis patebit. Detur enim* $y^3 = bvv - yvv$. *Nihil ab illa rejiciendum erit, cùm in ſingulis ejus partibus reperiatur* y *vel* v.

Sed ut ex Regulæ præſcripto diſponatur, bis ſumendum erit y v v, *& ſtatuendum tam in latere dextro, in quo ſunt partes quæ habent* v, *quàm in ſiniſtro, cujus partes habent* y ; *quandoquidem* y v v, *tam* y *quàm* v *contineat. Faciendum igitur erit*

$$y^3 + vvy = bvv - yvv.$$

Tum mutatâ, ut priùs, hac æquatione in aliam 3 y y a + v v a = 2 b v v − 2 y v v, *dabitur* $a = \frac{2bvv-2yvv}{3yy+vv}$.

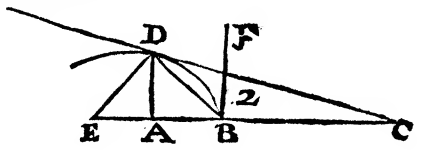
Ita enim intelligenda eſt Regula, ut nempe in latere non conſideretur poteſtas ipſius v, *ideoque ipſi* y v v *Exponens* vv *præfigi non debeat, ſed tantùm ipſius* y : *Sicut contra ab alio latere, in* y v v *conſiderari non debet poteſtas ipſius* y, *ſed* v *tantùm, eique ſuus Exponens præponi. Sic ſi foret* $y^3 + by^4 = 2qqv^3 - yyv^3$, *faciendum eſſet* $y^3 + by^4 + v^3yy = 2qqv^3 - yyv^3$; *& haberetur æquatio pro Tangente* $5y^4a + 4by^3a + 2v^3ya = 6qqv^3 - 3yyv^3$ *&* $a = \frac{6qq3-3yv3}{5y4+4by3+2v3}$.

Atque his Exemplis arbitror, me omnem, quæ dari poſſet, Caſuum varietatem complexum eſſe. Cæterùm non erit fortaſſe inutile, ſi ea quæ generatim expoſui, ad lineam aliquam ſingularem applicem. Data ſit igitur Curva BD, *cujus ea ſit proprietas, ut ſumpto in illa quolibet puncto D, ſi jungatur B D, & erigatur ad illam normalis DE, occurrens rectæ BE in E, recta D E ſit ſemper æqualis datæ rectæ B F. Ut*

habeatur

habeatur Æquatio in terminis Analyticis, ſit $DA = v$, $BA = y$, BF Fig. 2 *vel* $DE = q$. *Erit itaque* $EA = \frac{vv}{y}$. *Et cùm quadratum* DE *æquale ſit duobus* DA, AE; *erit æquatio* $qq = \frac{v^4}{yy} + vv$; *ſive* $qqyy = v^4 + yyvv$; *quæ pro Tangente, ex Regulæ præſcripto, ſic reformanda erit,*

$$qqyy - vvyy = v^4 + yyvv$$
$$2qqya - 2vvya = 4v^4 + 2yyvv$$
$$a = \frac{4v^4 + 2yyvv}{2qqy - 2vvy}.$$



Quomodo autem Æquationes hujuſmodi ad faciliores terminos pro conſtructione reduci debeant, id ſanè ſolertem Geometram minime latebit. Ut ecce in hoc Exemplo, quoniam Rectangulum BAE *ſupponitur æquale Quadrato* AD, *ſi* EA *dicatur* e, *erit* $vv = ye$, *&* $v^4 = yyee$, *&* $qq = ye + ee$. *Itaque pro illis, poſito in æquatione eorum valore, fit* $a = \frac{4yyee + 2y3e}{2eey + 2eyy - 2ey}$, *ſive* $a = \frac{2ey + yy}{e}$, *hoc eſt,* $ae = 2ey + yy$ *& addito* ee *utrinque* $ae + ee = ee + 2ey + yy$. *Erant itaque tres* $e \mid e + y \mid e + a$, *ſive* EA, EB, EC, *in continua analogia, & facillima evadet conſtructio.*

Cæterùm, quoniam hactenus ſuppoſuiſſe videmur, Tangentem verſùs partes B ducendam eſſe, cùm tamen ex datis accidere poſſit, ut vel parallela ſit ipſi AB, vel etiam ducenda ad partes contrarias; definiendum nunc ſupereſt, quomodo hæc Caſuum diverſitas in Æquationibus diſtinguatur, Factâ igitur Fractione pro a, ut in Exemplis ſupra adductis, conſideranda ſunt partes tam Numeratoris quàm Denominatoris, & earum ſigna.

1. *Nam ſi in utroque, partes vel habeant omnes ſignum +, vel ſaltem Affirmatæ prævaleant Negatis, ducenda erit Tangens verſus B.*

2. *Si Affirmatæ prævaleant Negatis in Numeratore, ſed æquales ſint in Denominatore, recta per D ducta, parallela AB tangit Curvam in D: hoc enim in caſu, a eſt infinitæ longitudinis.*

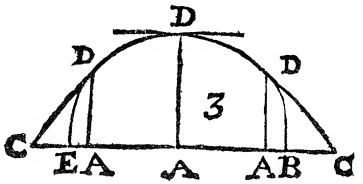
3. *Si tam in Denominatore, quàm Numeratore, partes Affirmatæ minores ſint negatis; mutatis omnibus ſignis, ducenda erit rurſus Tangens verſùs B: hic enim caſus cum primo in idem recidit.*

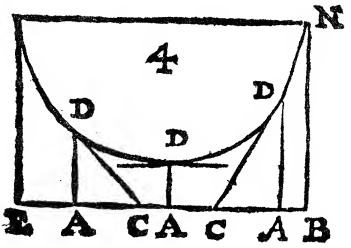
4. *Si in Denominatore prævaleant, in Numeratore minores ſint, vel contra; mutatis ſignis illius in quo ſunt minores, ducenda erit Tangens verſùs partes contrarias, h. e. AC ſumenda erit verſùs E.*

5. *Ac tandem ſi in Numeratore partes Affirmatæ ſint æquales Negatis, quomodocunq; ſe habeant in Denominatore, a abibit in nihilum. Itaq; vel ipſa AD erit Tangens, vel ipſa EA, aut ei parallela; quod ex datis facilè agnoſcitur. Horum autem Caſuum varietas explicari poteſt per Æquationes ad circulum.*

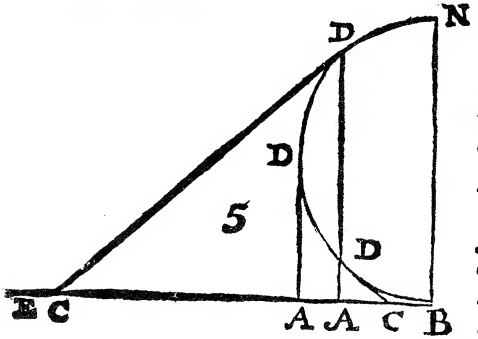
Vid.

Vid. Fig. 3. *Sit enim Semi-circulus, cujus diameter EB, & in eo punctum D datum, ex quo cadat normalis DA = v. Sit BA = y, BE = b; erit æquatio* b y − y y = v v, *& ductâ Tangente DC, erit AC sive* $a \frac{2vv}{b-2y}$. *Nunc ſi* b *major ſit* 2 y, *ducenda eſt tangens verſùs B; ſi æqualis, ſit parallela EB; ſin autem minor, ducenda eſt verſùs E; ut n.* 1. 2. *&* 4. *diximus.*





Vid. Fig. 4. *Detur rurſus alius Semi-circulus inverſus, cujus puncta referri intelligantur ad Rectam diametro parallelam, & eidem æqualem, ut in ſchemate. Denominatis, ut priùs, partibus, &* NB = d, *ſit æquatio* b y − y y = d d + v v − 2 d v. *Igitur* A C *ſive* $a = \frac{2vv-2dv}{b-2y}$. *Cùm verò in exemplo ſuppoſuerimus,* v *ſemper eſſe minorem* d; *ſi* b *ſit major* 2 y, *ducenda erit Tangens verſùs E; ſi æqualis, erit parallela; ſin minor, mutatis omnibus ſignis, ducenda erit verſùs* B; *ut n.* 4. 5. *&* 3. *Nulla autem ducenda eſſet Tangens, ſeu Tangens foret ipſa EB, ſi ſuppoſuiſſemus NB æqualem ſemi-diametro, ſive* 2 d = b; *ut n.* 5.



V. Fig. 5. *Sit tandem alius Semi-circulus, cujus diameter NB normalis ſit ad rectam BE, ad quam ejus puncta referri intelligantur. NB dicatur* b, *& aliæ partes denominentur ut ſuprà; fiet Æquatio* y y = b v − v v; *&* $a = \frac{bv-2vv}{2y}$. *Jam ſi* b *ſit major* 2 v, *Tangens ducenda erit verſùs B; ſi minor, verſùs E; ſi autem æqualis, ipſa DA erit Tangens; ut n.* 1. 4. *&* 5to.

Et hæc eſt, ni fallor, Caſuum omnium varietas, quæ ex Æquationum conſideratione deprehendi poteſt.

Quomodo verò ex doctrina Tangentium conſtituantur Æquationum Limites, non eſt ut pluribus exponam, cùm evidens eſſe exiſtimem, maximam vel minimam applicatarum vel utramque ſimul determinari à Tangente parallela: de quo & aliàs ad Te ſcripſi, & aliquid etiam attigi

Miſ-

Miſcelaneorum cap; *ubi &c., quâ ratione flexus contrarii curvarum ex Tangentibus inveniantur, oſtendi. Eadem ratione reperitur quoque* μαναχὸς λόγος, *ut vocat* Pappus, *& multa alia; quæ ſi explicare vellem, liber mihi ſcribendus eſſet. Nam & in Phyſico-mathematicis Uſus quoque hujus Regulæ opinione major eſt: Licèt enim falſum ſit Axioma,* Naturam agere per lineam breviſſimam; *veriſſimum tamen eſt, Viam ſequi determinatam, &, ubi nullam invenit, agere* ἀοριστως. *De quo aliàs plura, ſi tanti Tibi viſum fuerit: jam enim epiſtolæ modum exceſſi, ac vereor, ne, dum obſcuritatem vitare ſatago, in prolixitatem incidam. Addo tantùm, me Regulæ meæ* Demonſtrationem * *habere facilem, & quæ ſolis conſtet Lemmatibus; quod mirum Tibi fortaſſe videbitur. Vale. Dabam* Leodii *d.* 17. Januar. *CIↃIↃCLXXIII.*

* Non dubitamus, quin rogatu noſtro Illuſtris & Candidus hic Author Demonſtrationem hîc indigitatam Nobis etiam brevi ſit communicaturus.

An Accompt of ſome Books.

I. *A Diſcourſe concerning the Origin and Properties of WIND, &c. By* R. Bohun *Fellow of N. Coll. in Oxon. Printed at* Oxford 1671. *in* 8°.

THe Induſtrious Author of this Diſcourſe, having conſider'd with himſelf, how little Progreſs had been made, as in general, in the *Hiſtory* of *Nature*, ſo, in particular, concerning the Hiſtory of *Winds*, till our Voyages to the *Eaſt* and *Weſt-Indies*, and the great advancement of Navigation in this and the precedent Age, furniſh't us with ſo many new Diſcoveries and Improvements in all Natural knowledge, eſpecially in the Motions of the *Winds* and *Seas*, that we muſt acknowledge the Inſufficiency of the Theories received from the Schools of the Antients; having, I ſay, conſidered this, and withall met with frequent opportunities of converſing with the moſt Experienced of our Sea-Captains, giving him good information of the Courſe of the *Trade-winds*, the *Indian Monzoons*, the ſeveral ſorts of *Briſes* in the African and American Climates, *Hurricans*, and other tempeſtuous Winds: Endeavoureth in this Diſcourſe to give a fuller Accompt of this Subject than former Writers have done, proceeding therein, as he aſſureth the Reader, with great caution, in ſeldom making uſe of any Account of Voyagers, but when ſeveral Relations did agree in the ſame Particulars, or when he